CLAIMS

1. A wiring board which comprises at least one spherical semiconductor element, an electrically insulating substrate and a predetermined wiring pattern which is located on each main surface of the electrically insulating substrate,

wherein the electrically insulating substrate is made of a resin composition, and the wiring pattern formed on one main surface of the electrically insulating substrate and the wiring pattern formed on an opposite main surface are electrically connected through a wiring formed on a surface of the spherical semiconductor element, and the spherical semiconductor element is embedded at least partially in the electrically insulating substrate.

2. The wiring board according to claim 1 wherein the wiring patterns on the both main surfaces of the electrically insulating substrate are also connected by means of a via hole conductor which is provided in the electrically insulating substrate.

3. The wiring board according to claim 1 or claim 2 wherein a passive element and/or an electronic part is further embedded in the electrically insulating substrate.

4. The wiring board according to claim 3 wherein at least one of the wiring pattern formed on one main surface

of the electrically insulating substrate and the wiring pattern formed on an opposite main surface is connected to the passive element and/or the electronic part through the via hole conductor.

5. The wiring board according to any one of claims 1 to 4 wherein a portion of the spherical semiconductor element is exposed from the electrically insulating substrate and a bump is formed on a periphery of the exposed spherical semiconductor element above the electrically insulating substrate, the wiring patterns formed on the main surfaces of the electrically insulating substrate and the wiring of the spherical semiconductor element are connected through the bump.

6. The wiring board according to any one of claims 1 to 5 wherein the electrically insulating substrate is a transparent substrate.

7. The wiring board according to any one of claims 1 to 6 wherein the electrically insulating substrate is made of a mixture which contains an inorganic filler and a thermoset resin.

8. The wiring board according to any one of claims 1 to 8 wherein it comprises other spherical element which is made of an electrically insulating material in addition to the spherical semiconductor element.

9. The wiring board according to any one of claims 1

to 8 wherein a plurality of the spherical semiconductor elements are embedded such that they are arranged along a thickness direction of the wiring board.

10. The wiring board according to any one of claims 1 to 9 wherein the electrically insulating substrate further comprises at least one layer of a wiring pattern in its inside, whereby the wiring board is a multilayer wiring board.

11. The wiring board according to any one of claims 1 to 10 wherein at least a portion of the wiring board is flexible.

12. The wiring board according to any one of claims 1 to 11 wherein the wiring board is composed of a plurality of wiring board parts which have different flexibilities respectively.

13. The wiring board according to claim 12 wherein the different flexibilities are provided by a rigidizing element(s) which is present in the electrically insulating substrate.

14. The wiring board according to any one of claims 1 to 13 wherein at least one of the wiring patterns on the main surfaces of the electrically insulating substrate comprises a terminal of an electronic part which is located on the main surface of the electrically insulating substrate.

15. The wiring board according to any one of claims 1 to 14 wherein the electrically insulating substrate of the

wiring board is made of a resin composition which contains as its main component at least one elected from the group consisting of a polyimide resin, a wholly aromatic polyamide resin, an epoxy resin, a phenol resin, a wholly aromatic polyester resin, an aniline resin, a polydiphenyl ether resin, a polyurethane resin, a urea resin, a melamine resin, a xylene resin, a diallyl phthalate resin, a phthalic resin, a fluororesin, and a liquid crystal polymer.

16. The wiring board according to claim 15 wherein the resin composition contains at least one inorganic filler selected from the group consisting of alumina, silica, aluminum nitride, boron nitride, and magnesium oxide.

17. The wiring board according to claim 16 wherein the inorganic filler has coatings on its particle surfaces which coatings made of a saturated or unsaturated fatty acid.

18. The wiring board according to any one of claims 1 to 17 wherein it has a notch in its periphery.

19. An electronic device which comprises the wiring board according to any one of claims 1 to 18.

20. A process of producing a wiring board which contains a spherical semiconductor element, comprising at least the steps of:

(1-a) embedding the spherical semiconductor element totally in a prepreg substrate which is made of a curable

resin composition in its uncured condition;

(1-b) forming respectively, on carrier sheets, bumps and wiring patterns which are to be connected through a wiring of the spherical semiconductor element so as to obtain an upper wiring pattern transfer material and a lower wiring pattern transfer material;

(1-c) locating and aligning each of the above mentioned wiring pattern transfer material, through a resin sheet in its uncured condition, on each side of the prepreg substrate in which the spherical semiconductor element is embedded, followed by heating with pressing so as to integrally bond them, whereby the prepreg substrate and the uncured resin sheets are made into an electrically insulating substrate while the wiring patterns are connected with the wiring of the spherical semiconductor element; and

(1-d) removing the carrier sheets and leaving the wiring patterns and the bumps on the electrically insulating substrate so as to transfer them.

21. A process of producing a wiring board which contains a spherical semiconductor element, comprising at least the steps of:

(2-a) embedding a portion of the spherical semiconductor element in a prepreg substrate which is made of a curable resin composition in its uncured condition, so that a portion of the spherical semiconductor

element is exposed above at least one main surface of the prepreg substrate ;

(2-b) forming respectively, on carrier sheets, bumps and wiring patterns which are to be connected through a wiring of the spherical semiconductor element so as to obtain an upper wiring pattern transfer material and a lower wiring pattern transfer material, provided that as to the transfer material which is, in the following step (2-c), placed on a side of the prepreg substrate on which side the portion of the spherical semiconductor element is exposed, a hole is also formed through the carrier sheet which hole such portion is able to pass through;

(2-c) locating and aligning each of the above mentioned wiring pattern transfer sheets, through a resin sheet in its uncured condition (provided that a hole is formed through the resin sheet which is to be placed on the side of the prepreg substrate on which side the portion of the spherical semiconductor element is exposed), on each side of the prepreg substrate in which the spherical semiconductor element is embedded while the exposed portion of the spherical semiconductor element is located through the holes of the carrier sheet and the resin sheet, followed by heating with pressing them so as to integrally bond them, whereby the prepreg substrate and the uncured resin sheets are made into an electrically insulating

substrate while the wiring patterns are connected to each other with the wiring of the spherical semiconductor element; and

(2-d) removing the carrier sheets and leaving the wiring patterns and the bumps on the electrically insulating substrate so as to transfer them.

22. A process of producing a wiring board comprising at least the steps of:

(3-a) embedding at least a portion of a spherical semiconductor element in a prepreg substrate which is made of a curable resin composition in its uncured condition, and also embedding a passive element having terminal electrodes at its both ends respectively;

(3-b) forming respectively, on carrier sheets, bumps and conductive thin layers as well as wiring patterns which are to be connected to each other through a portion of the wiring of the spherical semiconductor element which portion is exposed so as to obtain an upper wiring pattern transfer material and a lower wiring pattern transfer material;

(3-c) locating and aligning each of the above mentioned wiring pattern transfer materials, through a resin sheet in its uncured condition (provided that a hole is formed through a region of the resin sheet which region is to face the conductive thin layer when the transfer material is so located and aligned), on each side of the prepreg

substrate in which the spherical semiconductor element is embedded while the conductive thin layers are located on the terminal electrodes of the passive element, followed by heating with pressing them so as to integrally bond them, whereby the prepreg substrate and the uncured resin sheets are made into an electrically insulating substrate while the wiring patterns are connected to each other with the wiring of the spherical semiconductor element; and

(3-d) removing the carrier sheets and leaving the wiring patterns and the bumps on the electrically insulating substrate so as to transfer them.

23. A process of producing a wiring board in which a spherical semiconductor element is used, comprising at least the steps of:

(4-A) providing the spherical semiconductor element having a wiring on its surface;

(4-B) embedding a passive element in the form of a chip having a terminal electrode at its each end in each prepreg substrate which is made of a curable resin composition in its uncured condition, so that a part embedded upper prepreg substrate and a part embedded lower prepreg substrate are obtained;

(4-C) forming a space in a predetermined position in each of the part embedded upper prepreg substrate and the part embedded lower prepreg substrate;

(4-D) forming respectively, on carrier sheets, conductive thin layers and wiring patterns which are to be connected to each other by the wiring of the spherical semiconductor element, so that an upper transfer material and a lower transfer material are obtained;

(4-E) locating a resin sheet in its uncured condition in at least one of a space between the part embedded upper prepreg substrate and the part embedded lower prepreg substrate, a space between the part embedded upper prepreg substrate and the upper transfer material and a space between the part embedded lower prepreg substrate and the lower transfer sheet, and also locating the spherical semiconductor element between the part embedded upper prepreg substrate and the part embedded lower prepreg substrate, followed by aligning all of them;

(4-F) heating so as to bond the transfer sheets, the prepreg substrate, and the resin sheets while pressing them together so as to make the prepreg substrate and the resin sheets into an electrically insulating substrate while connecting the passive element to the wiring of the spherical semiconductor element; and

(4-G) removing the carrier sheets and leaving the wiring patterns and the bumps on the electrically insulating substrate so as to transfer them.

24. A process of producing a wiring board which

contains a spherical semiconductor element, comprising at least the steps of:

(5-1) providing a transfer material by forming a predetermined first wiring pattern on a carrier sheet;

(5-2) mounting, on a predetermined position of the first wiring pattern of the transfer material, at least one spherical semiconductor element having a wiring on its surface so as to provide a first transfer material;

(5-3) providing a second transfer material by forming a predetermined second wiring pattern on a carrier sheet;

(5-4) superimposing a prepreg substrate made of a uncured resin composition and the two transfer materials such that the first wiring pattern and the second wiring patter are opposed through the prepreg substrate, followed by pressure bonding them at a heated temperature under an elevated pressure, so that the spherical semiconductor element is embedded into an electrically insulating substrate while the first wiring pattern and the second wiring pattern are connected by the wiring of the spherical semiconductor element; and

(5-5) removing the carrier sheets so as to transfer the first wiring pattern and the second wiring pattern.

25. A process of producing a wiring board which contains a spherical semiconductor element, comprising at least the steps of:

(6-1) providing a first carrier sheet comprising a first metal layer on its surface;

(6-2) mounting, on a second metal layer placed on a surface of a second carrier sheet, at least one spherical semiconductor element having a wiring on its surface;

(6-3) superimposing while aligning the first carrier sheet and the second carrier sheet such that their metal layers are opposed to each other through a prepreg substrate made of an uncured resin composition, followed by pressure bonding them at a heated temperature under an elevated pressure, so that a laminate is obtained in which the spherical semiconductor element is embedded into an electrically insulating substrate while the first metal layer and the second metal layer are connected to the spherical semiconductor element; and

(6-4) removing the first carrier sheet and the second carrier sheet from the laminate, followed by processing as predetermined to obtain a first wiring pattern a the second wiring pattern.